UNIT-5 Material Management

Learning Outcomes

By the end of this unit the learner will be able to:

- ✓ Explain the Issues Relating to Purchase and Storage of the material.
- ✓ Describe the Integrated materials management approach.
- ✓ Identify the role of material management in construction.

Unit 5

Material Management

Introduction

Materials management is one of the basic functions of any business. Economic success of any organisation has a direct relationship with the efficiency of the material management. Material management can also be viewed as function which aims for integrated approach towards the management of materials in an organisation. Its main object is cost reduction and efficient handling of materials at all stages and in all sections of the organisation.

Material management's functions include several important aspects connected with materials such as purchasing, storage, inventory control, material handling,

Standardisation etc. Hence, now-a-days this subject has become increasingly important and requires a keen attention.

Materials management covers a very wide field and deals with materials cost, material supply, utilisation and its handling. It is primarily concerned with the planning and programming of materials and equipment, market research for purchase, procurement of materials, storage and inventory control, and transportation of materials etc.

In his unit, you will learn about the various aspects of materials management and their applications in construction industry.

Definition and Scope

Materials management can be defined as "the function responsible for the coordination of planning, sourcing, purchasing, moving, storing and controlling materials in an optimum manner so as a pre-decided service can be provided at a minimum cost".

By another definition, "materials management can be said to be that process of management which coordinates, supervises and executes the tasks associated with the flow of materials to, through, and out of an organisation in an integrated fashion".

Lee and Dobler define materials management as, "a confederacy of traditional materials activities bound by common idea - the idea of an integrated management approach to planning, acquisition, conversion, flow and distribution of production materials from the raw material state to the finished product state."

From the above definitions, it is clear that the scope of materials management is vast. It has, directly or indirectly, impact on the activities of many related departments in the organisation. Broadly, following can be identified as its main functions:

Materials Planning and Control

Based on the sales forecast and production plans, the materials planning and control is done. This involves estimating the individual requirements of parts, preparing materials budget, forecasting the levels of inventories, scheduling the orders and monitoring the performance in relation to production and sales.

Purchasing

This includes selection of sources of supply, finalisation of terms of purchase, placement of purchase orders, follow-up maintenance of smooth relations with suppliers, approval of payments to suppliers, evaluating and rating suppliers.

Stores and Inventory Control

This involves physical control of materials, preservation of stores, minimisation of obsolescence and damage through timely disposal and efficient handling, maintenance of stores records, proper location and stocking. Stores are also responsible for the physical verification of stocks and reconciling them with book figures. The inventory control covers aspects such as setting inventory levels, ABC analysis, fixing economical ordering quantities, setting safety stock levels, lead time analysis and reporting.

Importance of Materials Management

An analysis of the financial statements of a large number of private and public sector organisations indicate that materials account for nearly 60% of the total expenditure. The information on the average materials expenditure for different industry groups is shown in Table 5.1.

Percentage of Total Cost	Industry Groups
Above 75	Construction, Fabrication, Electrodes, Tea etc.
65-75	Wool, Sugar, Jute, Cotton, Yarn, Commercial Vehicles, Earth Moving Equipment, Scooters, Furniture etc.
55-65	Cotton Textile, Bread, Ship Building, Cables, Electricity Generator's, Refrigeration, Heavy Machinery etc.
45-55	Chemicals, Cement, Pharmaceuticals, Electronics, Paper, Engineering, Non-ferrous type Machine Tools, Explosives etc.
35-45	Fertiliser, Steel, Cigarettes, Transportation, Asbestos, News Print, News Paper, Ferrow Alloys, Aircraft Manufacturing etc.

Table 5.1: **Average material cost as Percentage of total cost**

Thus, the importance of materials management lies in the fact that any significant contribution made by the materials manager in reducing materials cost will go a long way in improving the profitability and the rate of return on investment. Such increase in profitability, no doubt, can be affected by increasing sales. But with the increased competition in the market, this alternative is not very easy to achieve. Besides, some increase in the profitability can be achieved by concentrating on the materials cost which is typically a major rupee item for most organisations. In fact, as market pressure intensifies, organisations will be forced to cut down the costs and here, the materials management steps in to play its role.

Since materials form major part of total cost, these offer a very good scope for reduction of total cost. A small percent in materials cost can result in large percent increase in profitability.

Consider, for example, a small company has total sales of £1000. Total cost is £900. Thus, the profit is £ 100 which amount to 10% of the sales. Suppose, out of total cost of £ 900, materials cost is £ 600.

Now if one percent saving in materials cost can be achieved, then the resultant saving is £6 (1 percent of 600) which directly adds to the profit, thus, profit becomes £ 106.

Therefore, in this case, we can see that 1 % saving in materials cost results into 6% increase in profit.

Issues in Materials Management

As per major activity groups involved in materials management in any organisation, several issues emerge which need to be considered while discharging its functions.

Some of these are as follows:

a. issues relating to materials planning,
b. issues relating to purchasing, and
c. issues relating to storage and material handling.

These are being discussed in greater detail in subsequent paragraphs.

Issues Relating to Materials Planning

Materials Identification

Materials management department closely and continuously coordinates with the engineering and design, production and process to help identify the materials, sub-assembly, spare parts tool and equipments needed in the process and manufacture of end products. It provides information with respect to various options alternative materials available/or could be made available to meet the needs of production. The engineering and design, production and process departments assess these alternatives for suitability to the design from functional point of view, from processing point of view, i.e. whether it will help in easier/faster/more efficient performance of process operations? Through meticulous assessment each of the material, components etc is identified. This assessment is a continuous process depending on new materials, substitutes, supply conditions or internal changes in the products, process methods, designs or schedules.

Standardisation

Basic purpose of standardisation is to achieve inter-changeability of parts/components internally in the organisation or even across industry. Second purpose is to reduce the number of varieties of parts/components used in the production process of the organisation.

For example, in manufacture of motor car a large number of nuts and bolts of different dimensions, different specifications may be in use, suitable for various applications in the product. Suppose there are 100 different types of nuts and bolts being used. Through proper standardisation, this number of different types can be brought down to 20 or 30 without compromising on functional quality and requirement of the product.

Make or Buy

Large organisations (even small organisations) usually are not in a position to manufacture all parts or components required to be used in the product manufactured by them.

This is because:

(a) It may not be economical to manufacture internally.
(b) In house expertise/technical skill may not be available.
(c) Additional capital required to set up facilities for the manufacture of the component may not be available.
(d) Specialised manufactures-suppliers of the specialized components may be operating in the market. The components of the right quality may be available at competitive rates.

From time to time, it needs to be reviewed whether certain items may be more advantageously manufactured in-house or to be brought from outside. Materials management activity helps the organisation in taking this decision from time to time. Engineering and design, production, finance department etc. also join together to help take this decision. A decision to make an item in-house has long term implications because the company's funds are to be invested into fixed assets to create the manufacturing facilities. Such a decision is very difficult to reverse later on.

Coding & Classification

A system of classification and codification for all items/parts/components; needs to be devised and implemented. So that detailed descriptions need not be referred to every time. The code assigned to an item is uniquely identified. It should be uniformly understood by all concerned in the organisation.

The following factors need to be considered while devising a classification and codification system:

(a) The basis of classification and codification should be same and consistently applicable to all items.
(b) It should cover all items presently in use and should be capable to take up any new items in future.

(c) Every item should have a unique code/or number such that there is one-to-one correspondence between code and the item. No Two codes should refer to the item, and no two or more items should have same code.

(d) The code should be uniformly used and understood throughout the organisation by the concerned persons. It should be simple to understand and apply. It should normally be self explanatory.

Several advantages accrue if proper codification system is used in the organisation.

(a) There is no need of long description. Each item can be described by using the codes.
(b) Correct identification of each and every item possible.
(c) Duplication of storage, purchase, etc. avoided since each item is uniquely identified.
(d) Uniformity is achieved in maintaining accurate records in all sectors, i.e. stores, purchase, finance, production etc.
(e) Can be used for location planning of materials in the stores.

Quality Specification Introduction

Materials department, engineering and design department, production department, collectively decide on required quality standards for every item so as to achieve the desired quality of the end product at the same time meeting the cost target of the end product. Agreed upon quality is precisely specified and becomes part of the item description and also integral part of the code used to identify the item. Usually, it is in the form of physical, chemical or performance specifications. Where Engineering Drawing or Blue Prints are provided for the part, the quality specifications become integral part of such Drawing or Blue Print. Other ways of specifying quality (which may be used single or in combination) are:

a. by providing samples *or* prototype,
b. by providing manufacturing operation specifications,
c. by Brand or Trade name,
d. by specifying well accepted market grades,
e. by specifying testing procedures and relevant standards, and
f. by specifying/providing engineering drawing/blue prints.

Proper quality specifications are of great help to the purchase department, the suppliers, and the inspection and testing sections.

Issues Relating to Purchasing

Centralised Vs Decentralised Purchasing

This issue is comparatively more important and relevant to large corporations operating multiple plants may or may not be located at different places. For a single place, organisation decentralisation might be feasible on a very limited scale. There are advantages relevant to both the policies. At times, better

results can be achieved through combining the two and specifically demarking the items or volumes for which central or local purchasing is responsible.

Some of the possible advantages of centralization are as follows:

a. Favourable price and terms can be negotiated because of large volume purchases.
b. Specialised vendors/ancillaries can be encouraged to take up manufacture and supply of items/components of required and specified quality.
c. Administration and control is comparatively more easy and efficient.
d. Number of personnel required is comparatively less, resulting into reduced overhead costs of purchasing.
e. Paper work, record keeping is consolidated. Possible to develop uniform procedures and policies.
f. It is easier to maintain the quality of purchased parts/items through centralised testing and inspection. It is also possible to conduct testing and inspection at the vendors facilities.
g. It is beneficial to the vendor also, in case the size of order constitutes major proportion of his total production capacity.

Some of the possible advantages of decentralisation are as follows:

(a) Coordination between purchase department and the user department in the plant is quicker and simple.
(b) It is possible to develop local suppliers, which can result into lower transportation costs and also lower levels of holding inventors.
(c) Availability of local suppliers, facilities, quicker readjustment of the internal requirements is feasible.
(d) Better quality coordination between local supplier and the plant can be maintained.
(e) Local control, local coordination, and local rescheduling become easy and quicker.

Normally, a well balanced combination of centralization and decentralization can be used more advantageously.

Single Source Vs Multiple Source Purchasing

The purchase department can decide to choose and depend on a single source for each of some selected items. In the extreme case, the department can decide to use single source for each of the item. On the other extreme, the policy may be to have multiple sources for each of the item. Each policy - single source or multiple sources - has its own advantages and disadvantages.

Advantages due to single source are as follows:

(a) For small total annual requirement of an item multiple sources tend to increase clerical and other expenses.

(b) Due to bulk purchases from single source, it becomes possible to avail of discounts of prices or freights or other services.
(c) Supplier tries to cooperate, update and improve his services because of long term relations.
(d) Scheduling of deliveries or long term contract is feasible.
(e) If supplier is the only producer or owns the patent or his quality is far superior than other suppliers or priced are highly competitive, one has to depend on single supplier.

Sometimes by judicious development of single suppliers on long term basis overall material cost can be reduced significantly.

Advantages of multiple sources are as follows:

(a) Dependency on single supplier is reduced.
(b) Breakdown, strike, stoppage of work with one supplier does not unduly affect the working of the company.
(c) Competition among suppliers keeps them alert.
(d) It provides flexibility in the choice of placing an order.

Vendor/Ancillary Development

This is somewhat similar to single/multiple supplier decision and also an outcome of make/buy decision. When total annual requirement is large and item is to be bought from the market, then it is worth to encourage ancillaries to take up the production and supply of the item to a parent company. The ancillary supplies a major portion of its production to parent company and remaining production is offloaded in the market. Parent company can also decide to help develop more than one ancillary for the same item if requirements of item are very large.

Vendor/ancillary development can be encouraged by parent company through any one or combination of the following:

- Providing item design/drawings,
- Providing technology for production,
- Helping in arrangement of finance,
- Helping by loaning of its technical persons,
- Extending credit facilities,
- Extending quality control/resting facilities, and
- Indirect/directly helping in getting raw materials.

Vendor performance is required to be reviewed from time to time, because performance may not remain uniform, and also because of dynamic changes in external as well internal environment. For example, new suppliers may enter the market, new substitutes may come into existence, the law may restrict ban/or favour some materials, internal product may change, schedule may change, design of products may change.

Size and Timing of Purchase Orders

This is an integrated issue. Stores and inventory, production schedules, suppliers capability, time lag, reliability, cost of holding inventory, and cost of placing orders, etc. all have an important bearing on how-much to order and when to order. Relative importance of material or an item to the organisation is also an important issue, since all items need not be considered equally for inventory management and control.

Some of the techniques used to classify items with respect to their relative importance arc as follows:

ABC Analysis

All items in use, are classified in respect to importance to their total value of annual consumption. A complete list in descending order of consumption value of items is created. It has been observed, in general, about 10%-15% of the items account for 60%-80% of total annual consumption value of all items these are termed as 'A' class items. About 15%-20% of items account for 15%-20% of the total annual consumption value of all items - these are termed as 'B' class items. The remaining approximately 10% of the items are classified as 'C' items

'A' Class items are subjected to highest level of control supervision and management.

'B' Class items are subjected to medium level of control, supervision and management.

'C' Class items usually are not subjected to elaborate control management. Since the cost of effort is not worth it.

For 'A' and 'B' class items, precise mathematical models for determination of economic order quantity (EOQ), frequency of purchase; safety stock/buffer stock level etc. can be used.

HML Classification

High, Medium and Low classification is done on the basis of importance of price/unit - unlike ABC where total consumption value was considered. It is for the management to decide beyond which level of price/unit, the items would be classified as 'H', 'M' and 'L'. Accordingly, 'H' classified items are required to be subjected to highest level of control, supervision and management. The general guidelines are accordingly devised by the management in respect to each of the classification.

VED Classification

The classification, i.e. VITAL, ESSENTIAL and DESIRABLE is done on the basis of importance of an item to the production process. Those which are highly important and whose non-availability may render the stoppage of production are classified as 'V', whereas those because of which, if not available, the production may be affected or hampered are classified as 'E' and others classified as ‘D’. In this classification, the opinion of technical people in the production process plays very important role. One can formulate a matrix

considering ABC and VED analysis.

FSN Classification

The FAST, SLOW AND NO -MOVING classification is based on rate of movement of items from the s re. The time lapsed since last issue from the stores becomes one of the indicators to be used for this classification. The fast moving items (F) need to be reviewed frequently for placing the purchase order whereas non-moving (N) items needed to be reviewed for disposal consideration.

It is the general policy of all public sector undertakings to encourage development of ancillaries, wherever required and to the extent feasible.

Vender Rating

Poor vendor performance can result into creating uncertainties with respect to delivery schedules, quantity and quality. This may often interrupt the production schedules, quantity performance of the producing company. The company may have to resort to emergency purchasing - thus, resulting into the increased cost of production. It becomes an important issue for the purchasing company to develop proper/objective vendor performance evaluation procedures which should act as an instrument to help both the parties. Continuous and close vendor performance evaluation helps in improving the performance of the materials management and also that of the production department and the company.

Several vendor rating techniques are prevalent. Vendors are assessed on a specified set or factors. Selection of factors depends on the item, production process, production schedules etc. Some of the factors are as follows:

- Adherence to delivery schedules, quantity schedules and quality specifications,
- Price competitiveness and long term financial strength,
- Flexibility and cooperativeness,
- Technical potential and capability,
- Service attitude,
- Packaging, freight and delivery capability and costs, and
- In-house testing facilities and reliability of test certificates.

Some of the rating methods are briefly discussed as follows:

Weighted Point Method

Under this method, purchasing company assigns relative weights to some important factors identified in respect of an item. Then performance of vendors is evaluated on each of the factors and overall rating arrived at by combining these evaluations in proportion to weights.

For example, with respect to an item and the vendor(s), the company may decide that price, quality and delivery schedules are the three important factors for performance evaluation. The company may decide the weights 40:40:20 respectively. The overall rating may be arrived at,

$$\text{Overall Rating} = \frac{\text{Lowest Price Available in the Market}}{\text{Price quoted by the vendor}} \times 0.40 + \frac{\text{Number of lots accepted}}{\text{Number of lots supplied}} \times 0.40 + \frac{\text{Delivery time allowed in days}}{\text{Actual time taken for delivery}} \times 0.20$$

Accordingly, the company can compare the performance of vendors and also decide which should be preferred and which should be dropped.

Check List Method

In this method, with respect to factors identified a check list is circulated amongst concerned departments. The concerned departments have to give their evaluation in respect of each question in the check list. Based on the compilation on overall rating/score can be arrived at.

Critical Incidents Method

A record of significant events occurred in the past with respect to dealings with each of the vendor are maintained and overall assessment arrived at. For example, a particular lot may contain extremely high percentage of rejects; a particular delivery might have been unduly delayed affecting the production schedules.

All these classifications help in identifying more important items to be taken up for close supervision and management by materials management on SELECTIVE basis. An organisation may require and use thousands of different items, therefore L it usually is not feasible to monitor all of them equally closely.

Quality Assurance of Incoming Materials

Purchase function has major responsibility, in consultation with production and engineering function to assure the quality of purchased material. Proper specifications have to be decided and finally conveyed as part of purchase orders. The characteristics/standards need to be put down in purchase orders in unambiguous items. The technical terms should uniquely be understood by the supplier. The testing and inspection methods/procedures, the type of tests that are required to be conducted; all need to be specified accurately:

The purchase department can achieve required quality of incoming material by :

a. conveying correct specifications,
b. assessing quality capability of supplier before placement of purchase order,
c. frequent testing and inspection at the suppliers production facilities, if considered necessary,
d. insisting on proper certification of despatched material from the supplier's facility,

e. proper packaging and transportation to avoid deterioration/damage/breakage during transition,
f. testing and inspection at the receiving end. Insisting on approved quantity and quality certificate by receiving point so as to release the payment,
g. proper storage in the warehouse/store so as to avoid deterioration/damage during storage, and
h. revising and conveying the quality specification as and when needed well in advance so as to avoid stockpiling and or getting mixed up of 'old' quality items with 'new' quality items.

All these steps, used appropriately, help in insuring the right quality of the incoming materials; which ultimately reflects in the final product of the company.

Issues Relating to Storage and Material Handling

Optimum Level of Inventory

How much inventory of each item is to be maintained? This is the result of trade off between keeping very high inventory resulting into high inventory holding costs vs keeping very low inventory with high risk of stock out. A related question is when to order and how much to order? What should be the level of recorder point and safety stock?

Location and Layout of Store

Location of store should be convenient from point of view of receipt and inspection of material and also from the point of view of easy accessibility to internal users. It also depends on the type of items handled, e.g. heavy material requiring rail head etc.

Layout depends on following factors:

- Safety from theft and pilferage,
- Damage etc.,
- Easy and safe storage,
- Minimising unnecessary handling within the stores,
- Efficient use of space, and
- Easy physical verification.

Storage System

A good storage system keeps in mind easy location and withdrawal of items when a required; easy to physical counting/verification; easy to readjust to allow storage of new arrival/receipt of materials, minimizing use of specialized material handling equipment etc.

There are usually following three material location systems prevalent:

Fixed Location

Items of particular type have pre-specified location and space. When this space is vacant other items usually are not placed here. Codification system earlier discussed, can be used by extending the code of an item to include its location in the stores.

Random Location

The items can be stored wherever space is available, as and when the item arrives in the stores. It creates difficulties in terms of locating the item when needed, same item may be placed at more than one place, physical verification to assess the present stock position etc.

Zoned Location

Items of a particular group type are stored in an area earmarked for that group.

Individual items of the group may be stored with respect to fixed or random location. Group codes can be used effectively.

Additionally, depending upon the type of item; stacking tray, shelf, slotted angles shelves can be effectively utilised.

Different types of containers which are compatible with the type of storage and material can also be effectively used to achieve safety, convenience, withdrawal and inspection.

Receiving Inspection and Record Keeping

All the material received at the store should be inspected as per the procedure specified with respect to quantity as well quality. It should tally with the specifications contained in the purchase order issued by the purchase department, and also with the document received along with the material received.

Agreed upon sampling techniques and testing procedures can be effectively used. Bad and damaged items not meeting the quality specification should be segregated from the good ones.

Proper and correct records for all receipts and issues need to be maintained for stores accounting, for checking present stock position, help the accounts and cost accounting functions in the organisation, to help compile and provide information for planning and decision making to all relevant levels and sections.

Material Handling and Equipment

The total system should be designed to minimise the unnecessary handling throughout the plant including the interior of stores specifically. The main objectives of material handling and equipment are as follows:

- To minimise the total material handling cost,
- To maintain proper flow of material throughout the plant, though all sections,
- To ensure safety of material during movement and to minimize damage and to reduce accidents,

- To reduce inter-movement time, and
- Compatible with material handling equipment. Different groups of equipment are various types of conveyors, various types of elevators, I cranes, transporting and storing equipment, pneumatic fluidizing equipment, and earth moving equipment etc.

Integrated Materials Management Approach

Having recognised the importance of the materials management function, let us now see why an integrated approach towards the materials management is necessary. As mentioned earlier, the various functions served by materials management include the materials planning, purchasing, receiving, stores, inventory control, scrap and surplus disposal etc. If some of the functions were to be separately handled, normally, a conflict of interests occurs. Purchasing department, if allowed to operate independently, may take decisions which result in sub-optimisation. For example, under a separate set up, by the purchase department may treat discount as a very important factor and buy large quantities to avail of the discount without taking into account its impact on the warehousing and carrying costs. In other words, we need to balance the conflicting objectives from a total organisation viewpoint so as to achieve optimum results for the organisation as a whole. An expansion, for example, will require planning for the increased requirements, developing new sources, revision in inventory levels, apart from the increased load in receipt of materials, inspection and storing.

In an integrated set-up, the materials manager who is responsible for all such inter-related functions, is in a position to exercise control and coordinate with an overview that ensures proper balance of the conflicting objectives of the individual function. Integration also helps in the rapid transfer of data, through effective and informal communication channels. This is crucial as the materials management function usually involves handling a vast amount of data. Therefore, integrating the various functions ensures that message channels are shortened and the various functions identify themselves to a common materials management department which, in turn, results in greater coordination and better control. Thus, the task involved requires a sound approach in principle and its applications to obtain the desired result. It is this thinking which has given rise to an "integrated materials management approach".

Advantages in Integrated Materials Management Approach

Organisations which have gone in a big way for the integrated materials management usually enjoy the following advantages:

Better Accountability

Through centralisation of authority and responsibility for all aspects of materials function, a clear cut accountability is established. Various user departments can direct their problems with regard to materials to one central point so that the action can be taken immediately. This helps in evaluating the performance of materials management in an objective manner.

Better Coordination

When a central materials manager is responsible for all functions, the departments under the materials manager create an identity which is common. This results in better support and cooperation in the accomplishment of the materials function. The user departments also find that they have to approach one department for discussing and solving their materials problems. This creates an atmosphere of trust and generally, better relations between the user departments and the materials management department.

Better Performance

As all the inter-related functions are integrated organisationally, greater speed and accuracy results in communication. Need for materials are promptly brought to the notice by materials planning. Purchase department is fed with stock levels and order status by stores and inventory control departments. All this calls for judicious decisions leading to lower costs, better inventory turnover, reduced stock-outs, reduced lead times and a general reduction in paper work.

Adaptability to EDP

The centralisation of the materials function has made it possible to design data processing systems. All information with regard to materials function is centralized under the integrated materials management function. This has facilitated the collection, collation and analysis of data, leading to better decisions. Advanced and efficient electronic data processing (EDP) systems can be economically introduced under an integrated set up.

Miscellaneous Advantages

Under a central materials manager, a team spirit is inculcated. This results in better morale and cooperation. The opportunities for growth and development are better in an integrated set up. An individual under such a set up is not confined to any one function alone, and he gets, over a period, exposed to broader aspects of the materials function.

Material Management in Construction

Construction is the process by which a structure is made or put in place with the purpose of facilitating further development activities by people. The main aim of each structure is to serve a definite purpose. Generally, the construction of a simple structure needs simple materials. But in some cases, it may require specialised goods or materials or goods already processed using manual labour or sophisticated machinery and equipment.

The essential components which go to make a construction are materials, labour and fuel either to transport goods or to run machinery to assist construction activity. Without the materials, the labour cannot produce any work and therefore, to keep the labour engaged without loss of time or money, there should be a good and optimum flow of materials.

Sometimes, these three components are called as resources, as they finally ensure a product. The flow of materials involves expenditure and therefore, all materials required for the complete work cannot be purchased right at the beginning. This would mean locking up the money for the materials not required until a long time later and spending away the money which might be utilised for other works.

The materials which account for a high percentage of the cost are bricks, cement, steel, wood, doors and windows of steel and aluminium, fittings, flooring tiles, paints, sanitary and plumbing items, glass items and electrical cables and fittings. Many times, the contract is given to a contractor who has to do the materials management. In a few cases, the client chooses to do the material procurement himself. But the task of materials management is usually associated with large organisations who keep doing a lot of constructions at different locations and maintain a steady flow of materials from a centrally located store from where the individual works are supplied with materials.

The art of phasing the purchase or acquisition of materials in the right quantities at the right moment or in other words, the skill of phasing the purchases and procurement of construction materials in a planned manner is called Construction Materials Management.

The basic need for any construction is the material which is to be incorporated in the work. For instance, stones and stone aggregate, bricks, cement, steel, timber are some of the essential items which are to be acquired in adequate quantities and at proper rates. Since no construction agency would like to purchase the materials at any rates or costs, the procurement of materials is to be planned keeping the need in view. The reliability of the supply is an important factor so that there is a continuous flow of materials and no stoppage of work takes place for the want of materials causing wastage of expenditure on *v* idle labour, tools and plant.

The material component in all the works is not the same. Normally, the cost of some important items in construction is known by experience. The component of materials cost varies from work to work. In normal buildings, the cost of bricks account for about 14% to 16% of the cost. Cement and steel account for as much as 40% to 45% of the cost in normal building works. In roadwork, the cost of stone aggregate may contribute to about 50% of the total cost. In a concrete bridge, the component of cost of steel and cement is as high as 50% to 55% and in a steel bridge the cost component of steel is likely to be 75% to 80%. In a water supply distribution work, the cost of pipes and other joining accessories can be as high as 80%. The percentage of cost contributed by materials in a work underlines the importance of ensuring an efficient materials planning and procurement policy suiting the expected output of the work.

The main purpose of planning the cost component of materials is to plan out the phases in which they are required and follow up the work ensuring a proper flow of funds. The idea is also to ensure supply of quality goods in time. It is a fact that in a situation where the money flow is easy and materials of good quality are always easily available 'on the shelf' and there is good competition among the vendors supplying the materials, the construction material planning becomes an easy task and perhaps, it is not even needed.

After understanding the importance of planning the inputs in construction, let us first know the essential construction components which are given in subsequent paragraphs.

Materials Costs

Modem constructions need many materials, some in raw condition and others in semi-processed or well-processed condition. For instance, one of the basic materials for construction, i.e. sand is produced in raw condition so also rough stones for many works.

Semi-processed items like timber sections, stone slabs and lime also account for some cost in construction. Well-processed materials use much of a manufacturing process using energy and made in highly sophisticated plants or factories. Such materials are cement, steel, glass, tiles, aluminium sections, cables, bitumen, paints, sanitary ware, boards etc. The cost of these items depends on the sophistication in the process. The cost of the items also depends on the government policies, taxation and other levies, and their demand. The grade of quality also accounts for the cost. The cost of work depends on the efficiency and care with which the materials are procured, utilising an optimum cash flow. Greater care is to be exercised on the materials which contribute to the maximum cost but at the same time, also continuously required for ensuring the desired output of the work.

Each type of work needs a different material procurement approach. In a road work where supply of stone is to be made continuously along the length of road, it may need an expenditure of about 70% on supply of aggregate. The identification of quarries for supply of stone aggregate becomes important. For work involving bitumen for road construction, a tie up with a petroleum product agency is necessary as the cost of bitumen might account for as much as 65% of the work. Thus, each work has its uniqueness in deciding the principal material components and therefore, it is necessary to establish the manner in which the flow of materials to the site is to be ensured. Sometimes, the necessity of material is not evident from the bill of quantities in the contract. For instance, an agency doing a road work, using a fleet of trucks, might need to plan supply of tyres and tubes to keep the vehicles on the road always, just like a road contractor doing a hill road has to form his material processing policy for the supply of explosives and drill bits regularly.

Thus, materials like cement, steel and bricks which may account for as much as 65% of the total cost need carefully planned procurement action. At the same time, indirectly required items also need careful attention. Previous experience of similar works in each situation will be of great help.

Labour Costs

Labour accounts for an expenditure differently on different works. Usually, by labour costs, we mean those costs which the particular contractor spends himself on employment of the labour engaged on the work. For instance, to a road contractor, the cost of labour engaged on stone breaking at the quarry site is not of any material importance though the labour costs on spreading of material on road is of importance to him. The cost of labour depends on the extent of mechanisation on the work or the quantum of processing done on the building components. For instance, the cost of labour on a precast housing would be much less as compared to a conventional construction. Now-a-days, because of the

management problems, stress is being laid on more and more mechanisation. At the same time, the basic unit cost on more sophisticated construction has not gained wide acceptability.

Normally, the labour cost components on finishing works are more. Though the labour cost component in normal works is in the range of 20% to 25%, the costs on labour in different subheads is different. Table 7.2 gives a general idea of the break up.

Different Category	Percentage
Skilled labour on building structure	45% of total labour cost
Unskilled labour on building structure	25% of total labour cost
Plumbing labour on building structure	3% of total labour cost
Glazing labour on building structure	1.70% of total labour cost
Electrical engineering labour on building structure	7.80% of total labour cost
Mechanical engineering labour on building structure	10.30% of total labour cost
Steel work labour on building structure	7.20% of total labour cost
TOTAL	100.00%

Table 5.2 Costs components for different categories

Therefore, it is necessary to plan the category of workers for each work, judging the quality of work needed, importance of work and the quality of raw materials procured for the work.

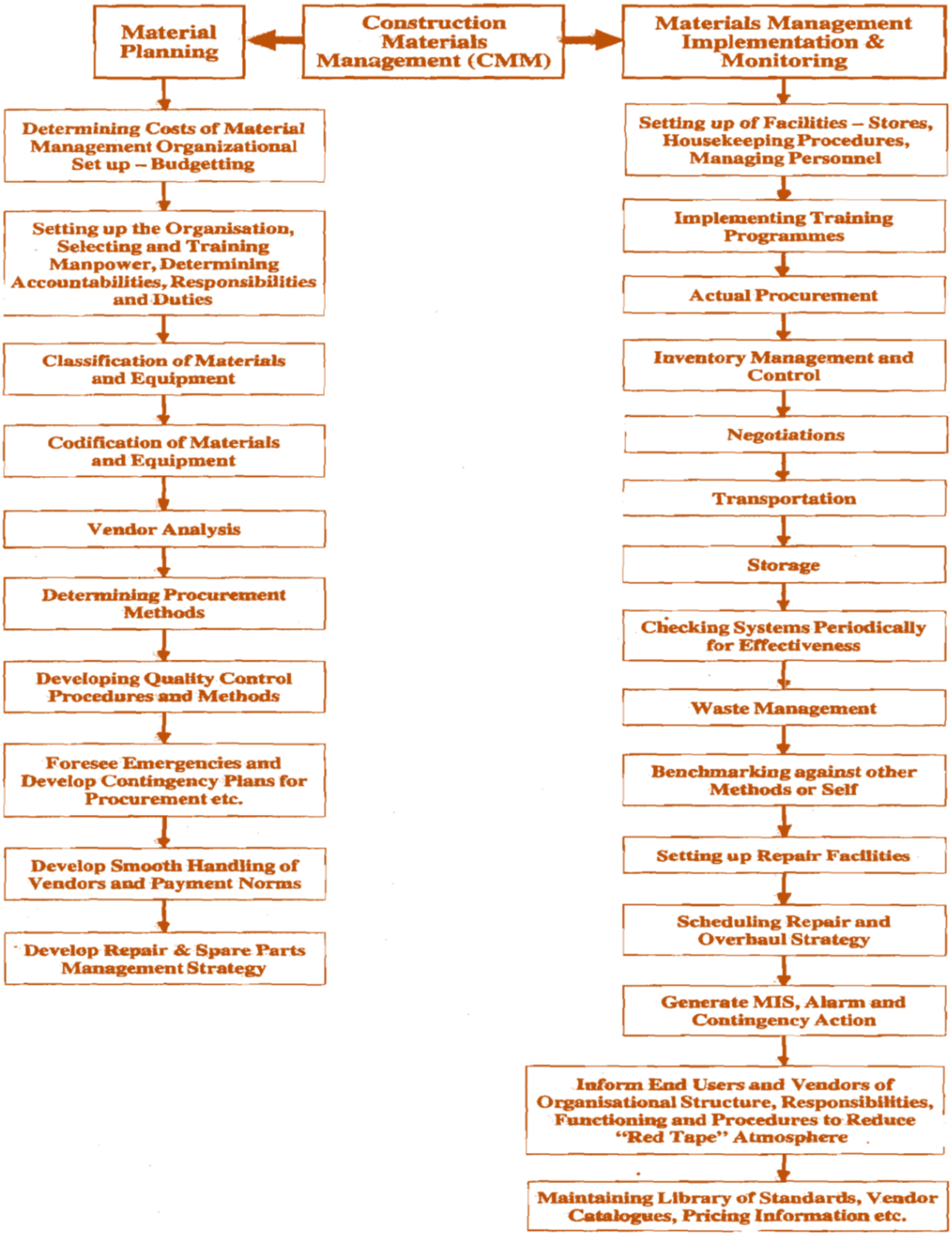
Special Materials Costs

For ensuring a steady progress of works, sometimes, it would be necessary to plan a supply of some materials which do not find a place in the bill of quantities .in the agreement. Though these items are also very important but their importance is felt only when they are out of stock with the construction stores manager at critical times. One such item is explosives needed on hill roads. Other items are tools and appliances. By far the most important items are spare parts for equipment, power and prime movers and pumps, scaffolding and cantering material. Whether the agency desires to get some such items on hire and use or procure them as permanent assets for tools, plant and equipment, I the construction material management principles apply to these items in the same manner.

These items are indirectly used on the work, but their availability at all the desired moments is of great importance. The saying "For the want of a nail, the battle was lost" is a very relevant quotation as far as Construction Materials Management is concerned.

What Encompasses Modern Construction Material Management

It is impossible to have one common set of activities which is valid for all situations like project management, central stores procurement, emergency procurement etc. However, the following outlines broadly most of the activities:



Further Reading:

- ✓ ***Peter Fewings, (2013), Construction Project Management: An Integrated Approach***
- ✓ ***K. DATTA, (1995), MATERIALS MANAGEMENT: PROCEDURES, TEXT AND CASES***